

Mental Noise

Broca

4 Channels Audio Mixer

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# Description

Broca is an Open Source 4 channels Eurorack Audio Mixer.

This module is inspired by the Doepfer A-138n and uses some parts of the schematics of the Befaco STMix.

While inspired by those modules, it is better at handling audio signals because of the high quality capacitors it uses on the audio path and the better overall noise filtering.

This module is designed to mix audio signals with very low noise and distortion.

Mixing CV signals is also possible but low frequency signals can get distorted in unexpected ways, try it and see if it works for you :)

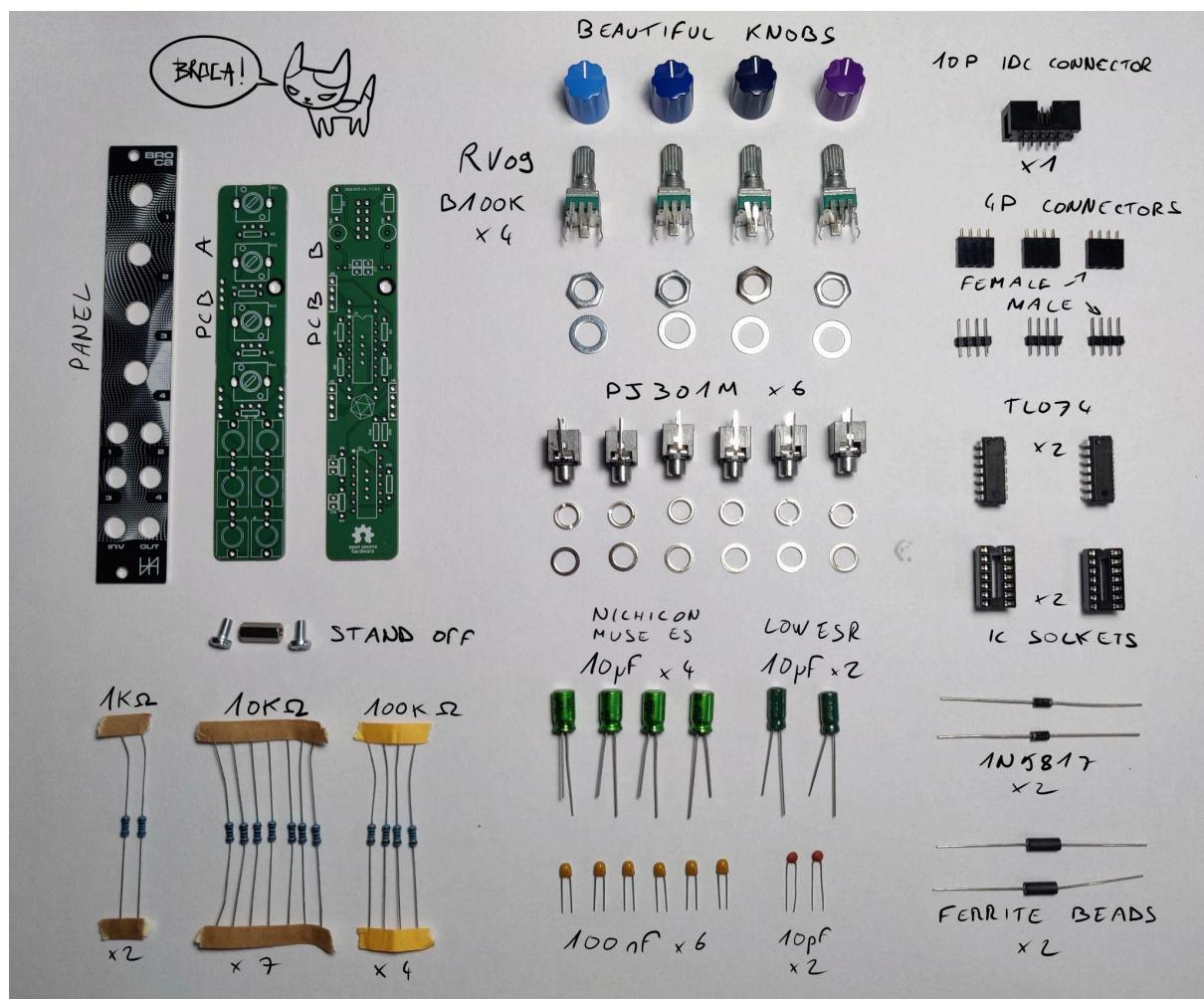
This module is super simple to use:

- 4 inputs
- 4 volume controls (1 for each input)
- 1 mix output
- 1 inverted output (mix output inverted)



# Build Guide

These are all the parts you'll need, let's get started!



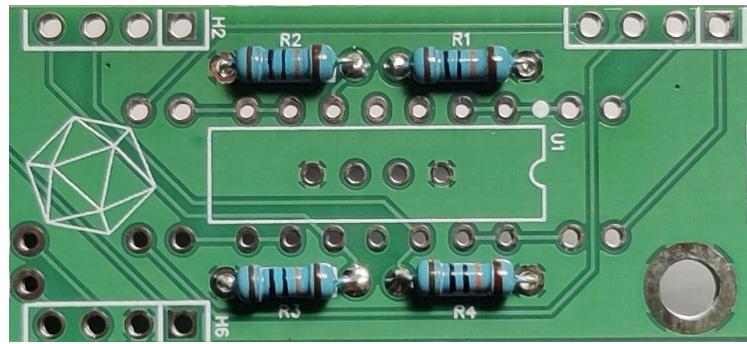
## PCB B

Take the PCB B, we'll start on the side with the "Open Source Hardware" logo visible. At some point, we'll need to solder some components on the other side, don't worry, I'll let you know :)

100k $\Omega$  resistors - R1, R2, R3, R4

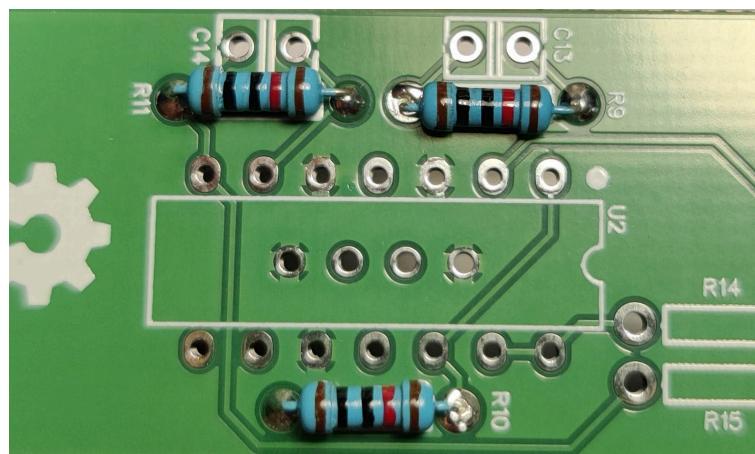
Start by soldering R1, R2, R3 and R4, these are the four 100k $\Omega$  resistors.

Resistors don't have polarity so the direction in which you install them doesn't matter. However, if you're like me and have a bit of OCD, you'll want all the resistors to point to the same direction!



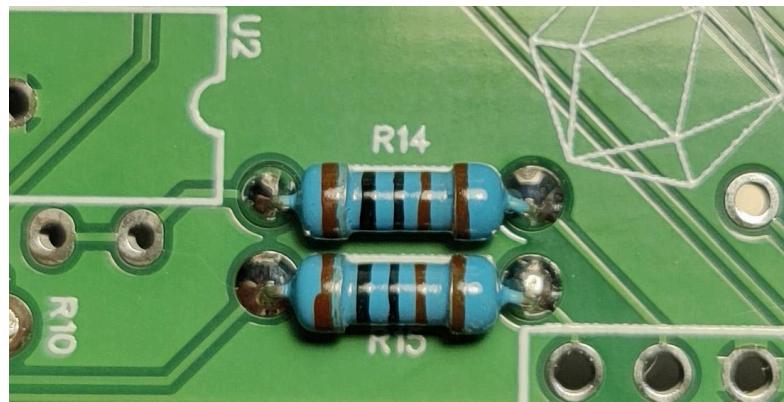
10k $\Omega$  resistors - R9, R10, R11

Solder three of the seven 10k $\Omega$  resistors R9, R10, R11. The four remaining resistors will be soldered later on the PCB A.



## 1k $\Omega$ resistors - R14, R15

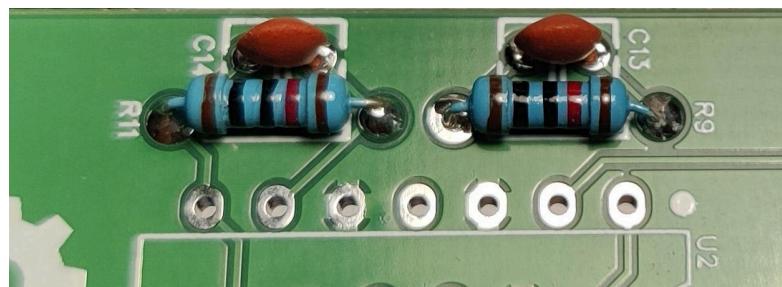
Solder the two 1k $\Omega$  resistors R14, R15.



## 10pF capacitors - C13, C14

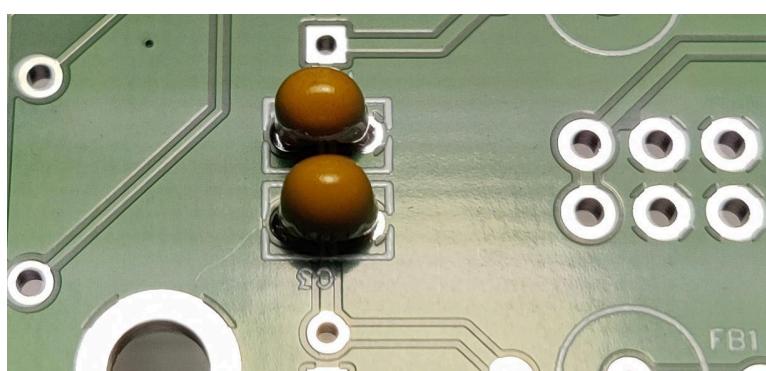
Those are the two small capacitor disks, solder them on C13 and C14.

Here again, the polarity doesn't matter.



## 100nF capacitors - C3, C4

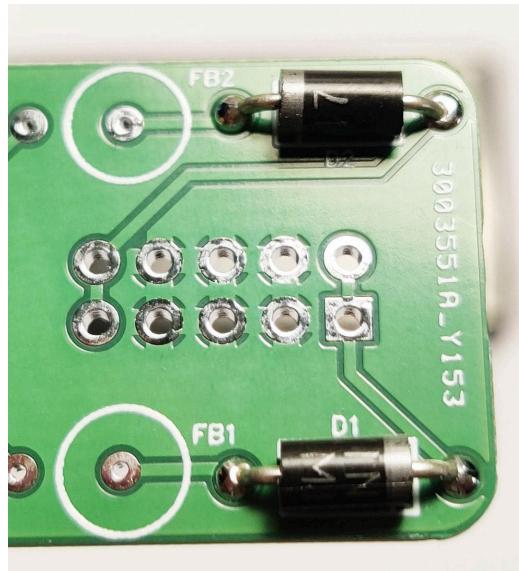
Those are the two small yellow capacitors (multi-layer ceramic capacitors), solder them on C3 and C4.



## 1N5817 diodes - D1, D2

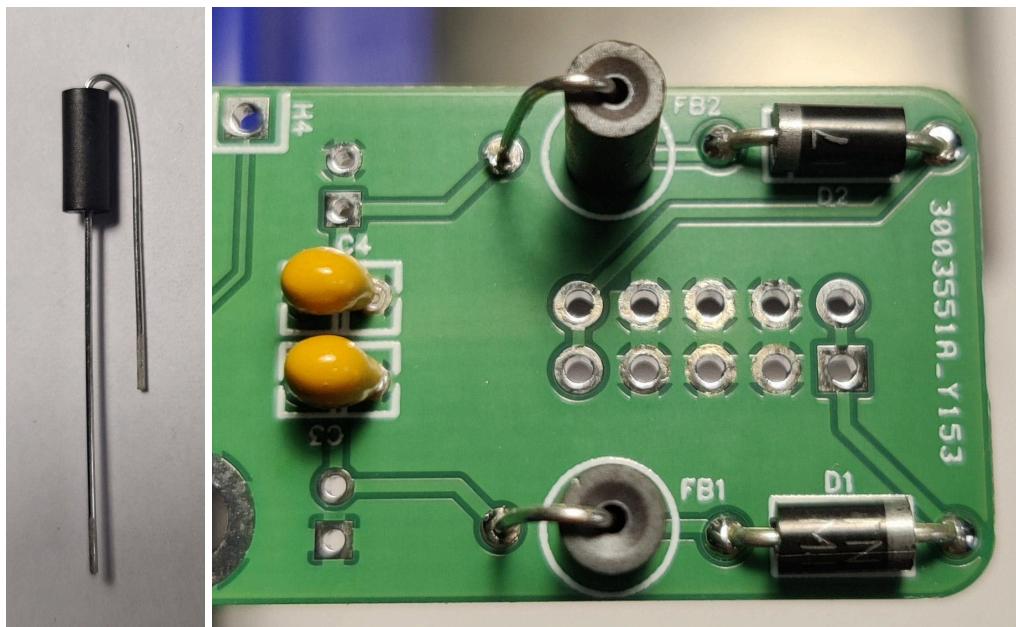
These are the only diodes of the kit and they are going on D1 and D2.

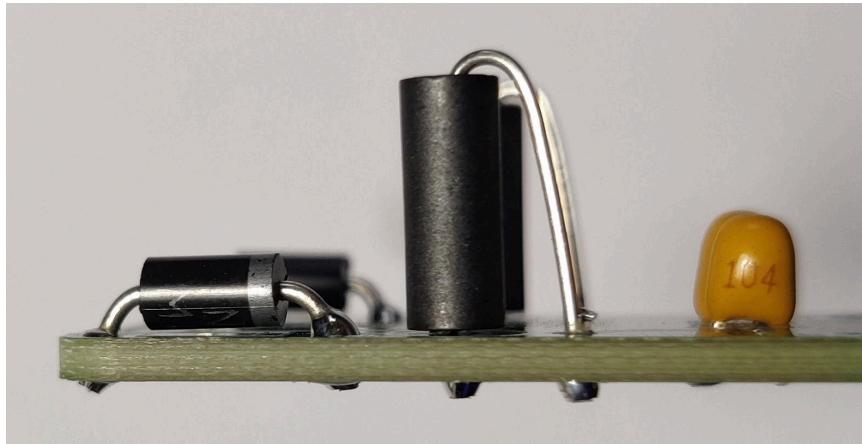
**Be careful as the polarity does matter here**, the white stripe on the diode needs to align with the one on the PCB.



## Ferrite beads - FB1, FB2

The ferrite beads are soldered vertically so one of their legs need to be bent first. Once gently bent, you can solder them on FB1 and FB2.





100nF capacitors - C5, C6, C7, C8

**Flip the board to place the remaining four 100nF capacitors on the other side!**

Solder them on C5, C6, C7 and C8.

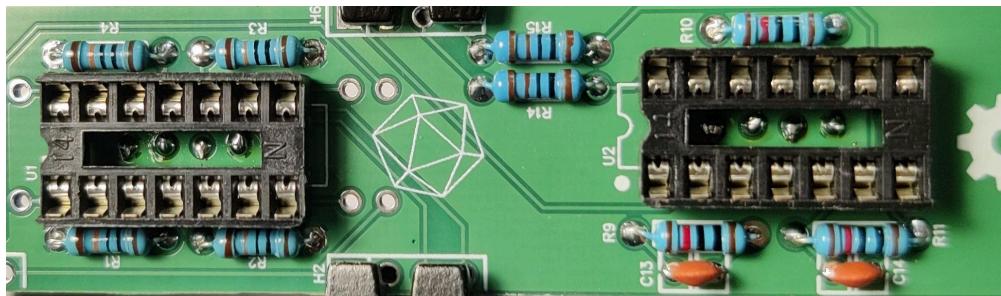


IC sockets - U1, U2

**Flip the board again** and put the IC sockets in place, they are going over the solder points you just did for the 100nF capacitors.

**Make sure the sockets align with the drawing on the PCB** (mind the semi circle indentation).

Bend one of the legs on each opposite corners so that they stay in place while soldering.

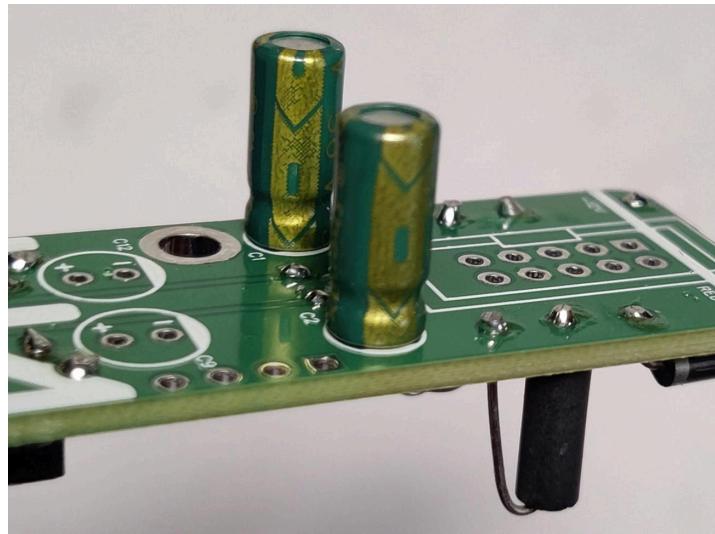


## 10µF LOW ESR capacitors - C1, C2

**Board flipping time!** (if you lost track, make sure you see the Mental Noise logo)

C1 and C2 are the two LOW ESR capacitors, if you didn't purchase the kit from me and don't have LOW ESR capacitors, replace them by generic 10µF electrolytic capacitors with a voltage rating of at least 25V (35 or 50V is preferred).

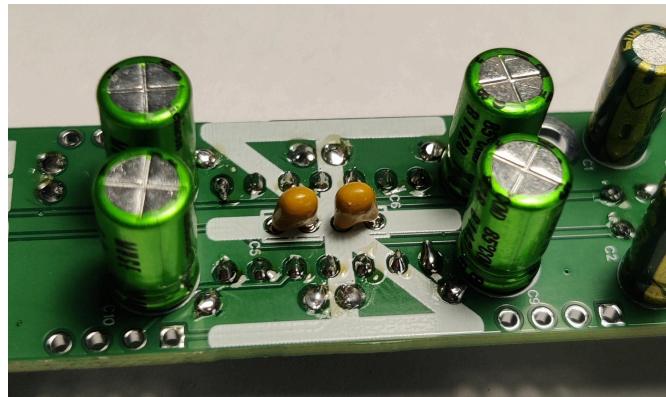
**Be careful as the polarity does matter here**, the white stripe (and/or the shortest leg) on the capacitors needs to align with the white stripe (and/or - symbol) on the PCB.



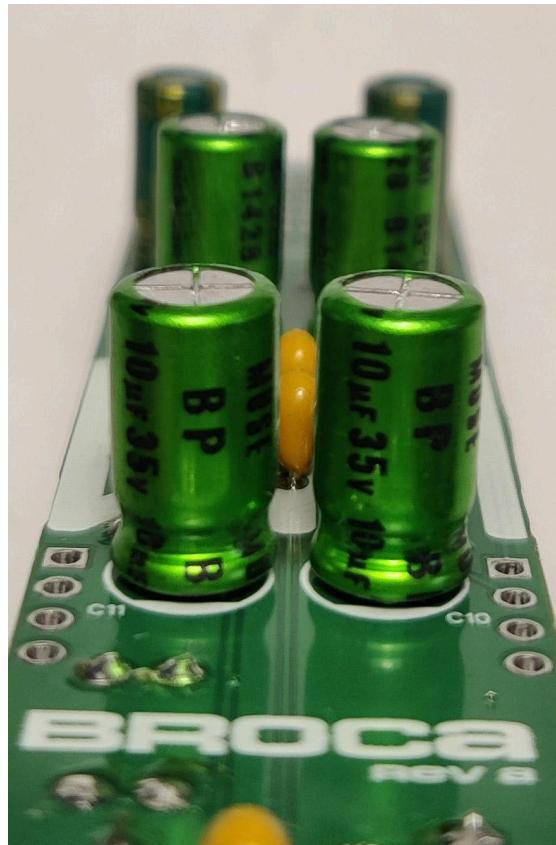
## 10µF Nichicon MUSE ES capacitors - C9, C10, C11, C12

These are the four nice and shiny green capacitors, they are bipolar (meaning they don't have a polarity) and are specifically made to handle audio signals.

If you didn't purchase the kit from me and don't have these specific capacitors, replace them by generic 10µF electrolytic capacitors with a voltage rating of at least 25V (35 or 50V is preferred), in which case you'll need to be careful with the polarity!

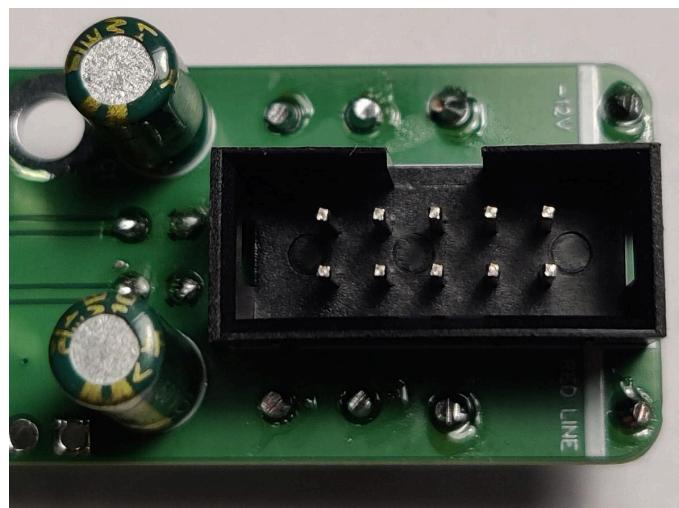


Look at these beauties! Can't you already hear the clear audio coming out of them?



### Eurorack power connector - 10P IDC

There is only one of these so you shouldn't miss it, just make sure you install it in the right position by following the drawing on the PCB!

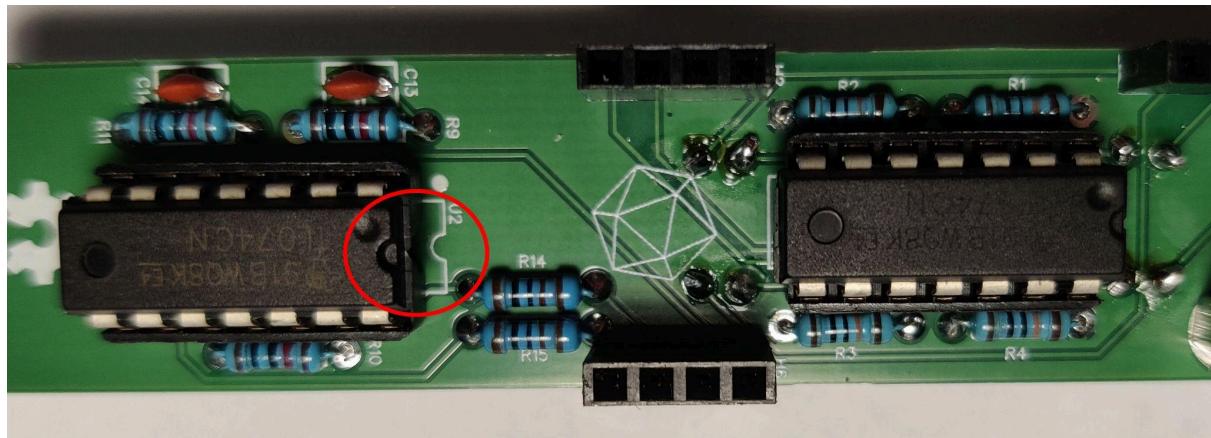


## TL074 - Amplifiers - U1, U2

At this point, you can install the two TL074 in their sockets.

**Don't use too much force** on them, if they don't go in, double check the legs are correctly aligned.

**Make sure to install them in the correct direction, the semi circle notch should match the one on the socket.**



Don't pay attention to the female headers you see on this picture, they come later, I just realized at the end of the build that the right step to install the TL074 is actually now.

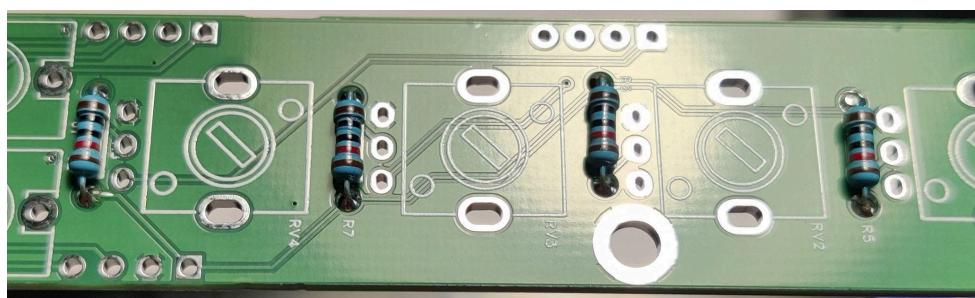
## PCB A

Well done on the first PCB, time to switch to the other one!

On this board, all the components go on the same side, the one where you can see the drawings of the potentiometers and jack sockets.

10k $\Omega$  resistors - R5, R6, R7, R8

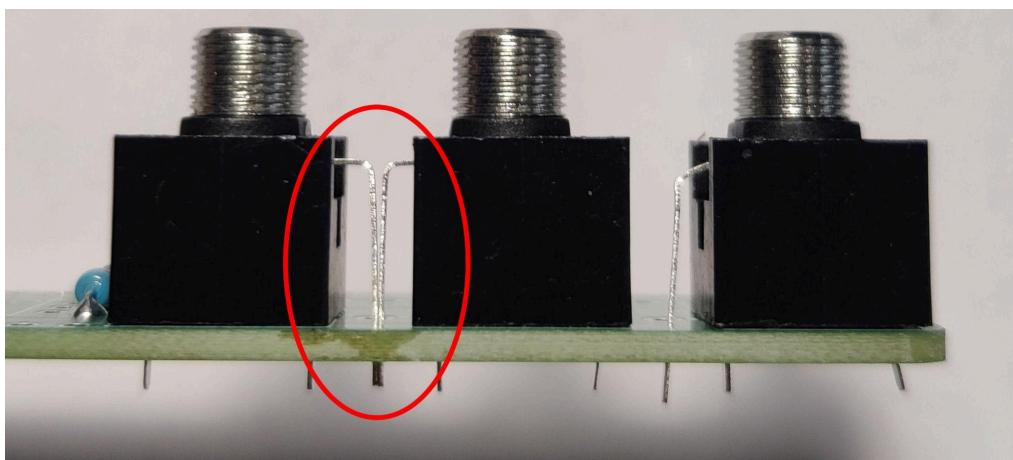
Solder the remaining four 10k $\Omega$  resistors on R5, R6, R7 and R8.



PJ301M - Mono jacks - J1, J2, J3, J4, J5, J6

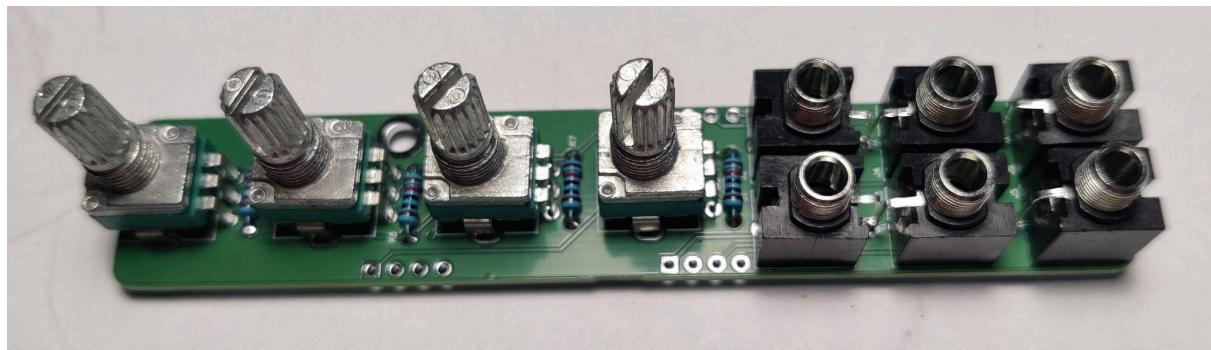
Insert the six jacks on the PCB, note that J1 shares its ground with J3 and the same applies for J2 and J4.

**Do not solder the jacks yet!**



B100kΩ potentiometers - RV09 - RV1, RV2, RV3, RV4

Place the four potentiometers but **don't solder them yet!**



Soldering time!

Now it's time to solder the jacks and the potentiometers.  
To make sure they align with the front panel, let's place it already.



Now that the front panel is keeping everything in place, go ahead and flip the whole thing.



You can now solder everything (the two supports on each side of the potentiometers don't have to be soldered on, you can but it's not mandatory).

When soldering a lot of components at once like on this step, it's easy to miss a leg or two so double check your work when you think you're done!

## Boards connections

Now that both PCBs have all their components soldered, it's time to add the connectors.

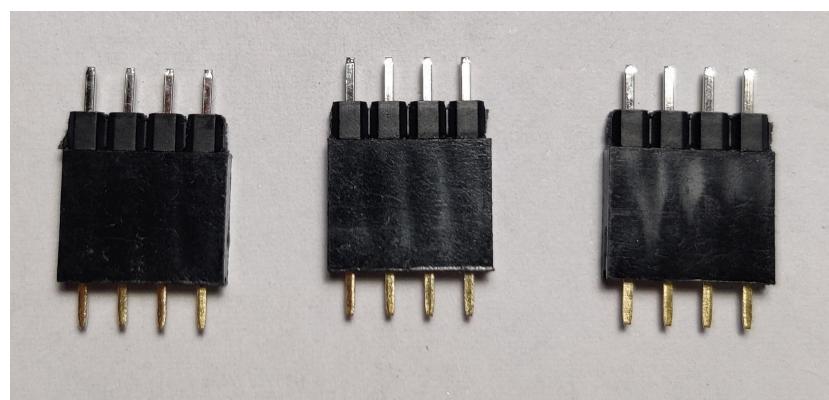
### Standoff

First screw the standoff on one of the PCBs, doesn't really matter which one.



### 4P male and female headers

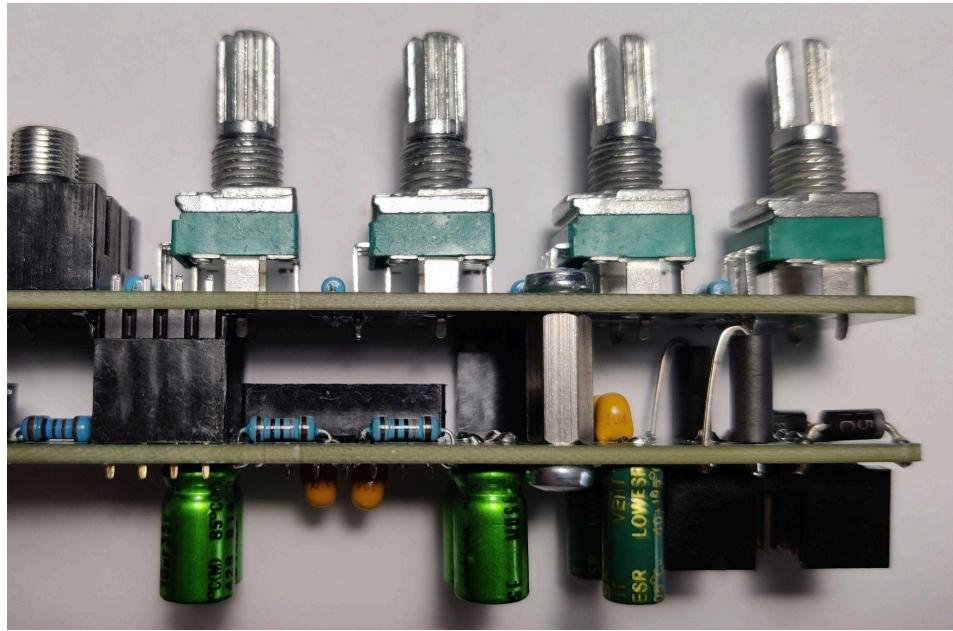
Connect the male and female headers together.



Then place them on the board with the standoff.

Logic would say that the female side would go on the PCB B but if you placed them in the opposite direction, that's no big deal.

Once in place on the first board, sandwich them with the second board and screw the standoff on that board too so that everything stays in place while soldering.



You can now solder the headers on both PCBs.

### Double check the ferrite beads

Make sure the ferrite beads don't touch the PCB A, there should be a small gap like on the picture.



## Clean the boards

To remove the flux residues left when soldering, it's important to clean the boards.

Unscrew the standoff and separate the boards.

Dip the boards in 99% isopropyl alcohol and brush them with a tooth brush (don't re-use it for anything else after that, and certainly not for your teeth!).

Dry them with paper towels and an hair dryer at mid position (not too hot).

Once dried, you can reassemble everything.

## Final assembly

Put the front panel back on and add all the washers.

Screw the nuts tightly but don't go too crazy.



Then add the knobs and you're done!

Congratulations!

You got yourself a nice looking and even better sounding 4 channels mixer! Well done :)

